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THE OFFICE OF ELECTRIC TRANSMISSION AND DISTRIBUTION

OVERVIEW

Chairman Biggert and members of the Subcommittee, thank you for the opportunity to testify today on the science and technology priorities for Fiscal Year 2005 within the Office of Electric Transmission and Distribution.

The mission of the newly created Office of Electric Transmission and Distribution (OETD) is to lead a national effort to modernize and expand America's electricity delivery system to ensure a more reliable and robust electricity supply, as well as economic and national security. This is vital to the Department's strategic goal to protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy.

The August 14, 2003 blackout demonstrated the vulnerability of the electric grid and thus its strategic importance to our Nation. President George Bush stated in September 2003: "…it's clear that the power grid needs an overhaul. It needs to be modernized. As we go into an exciting new period of American history, we want the most modern electricity grid for our people… we need more investment; we need research and development…"

The Administration has requested $90.9 million for OETD in FY 2005, a 12.5 percent increase over the FY 2004 comparable appropriation. This effort includes research, development, demonstration, technology transfer, and education and outreach activities in partnership with industry, businesses, utilities, States, other Federal programs and agencies, universities, national laboratories, and other stakeholders.

On September 25, 2003, I testified before this subcommittee on the role of new technologies in developing a more robust electric system. I identified a portfolio of technologies that have the capabilities to enhance the reliability and efficiency of the electric grid. They include Advanced Conductors and New Materials (a component of the new GridWorks initiative); High Temperature Superconductors; Electricity Storage;

Communications, Controls, and Information Technologies (emphasis of the GridWise initiative); Advanced Power Electronics (supported by both the Energy Storage Program Activity and the GridWorks Initiative); and Distributed Energy Technologies. Our priorities in Fiscal Year 2005 build upon those that I had highlighted in September.

Neither government nor industry alone can satisfy the Nation's electric infrastructure needs. The *National Delivery Technologies Roadmap* provides a framework for all of the electric industry stakeholders to work together to achieve common aims. The call for grid modernization is coming from all levels of leadership. The President's 2004 State of the Union Address asking Congress to "modernize our electricity system" reiterated the Administration's objectives first outlined in the *National Energy Policy [May 2001]* and reinforced, in more detail, in the *National Transmission Grid Study (NTGS) [May 2002]*.

Modernizing the grid will involve time, resources, and unprecedented levels of cooperation. The nation's aging electric infrastructure, and the increasing requirements placed on it, have contributed to market inefficiencies and electricity congestion in several regions. These conditions could lead to more outages, more power quality disturbances, higher prices, and the less efficient use of resources. We must act now or risk even greater problems in the future.

RESEARCH AND DEVELOPMENT

The Research and Development (R&D) Program within OETD, which will contribute to the modernization of the electricity system, consists of four main Program Activities that are continuing from FY 2004: High Temperature Superconductivity; Transmission Reliability; Electric Distribution Transformation; and Energy Storage. In FY 2005, these will be supplemented by the new GridWorks R&D initiative and the GridWise Initiative, and the Electricity Restructuring Program Activity.

The Transmission Reliability R&D Program Activity supports modernization of the Nation's transmission infrastructure through technologies that provide enhanced grid reliability and efficient electricity markets under competition. In FY 2005, the Transmission Reliability Program is focused on developing real-time monitoring and control software tools and system operating models for grid operators, and market design research, including demand response integration, to support restructured markets development.

The Electric Distribution R&D Program Activity supports R&D that will enable "plug-and-play" of distributed resources, including load, through the development and testing of advanced interconnection technologies and standards. This "plug-and-play" technology will allow the full integration of distributed resources into distribution operations, and lead to increased asset utilization and enhanced system reliability for the entire national electrical system.

The Energy Storage R&D Program Activity includes research in advanced energy storage devices for applications ranging from power quality for digital facilities to voltage support for transmission lines. In FY 2005, the Energy Storage Program will accelerate development of advanced storage technologies to mitigate grid congestion and increase grid stability, reducing the incidence of power quality disturbances.

Finally, the Electricity Restructuring Program Activity provides technical assistance and analytical support to States and regions for policies, market mechanisms, and activities that facilitate competitive, reliable, environmentally sensitive, and customer-friendly wholesale and retail electric markets. In FY 2005, the Electricity Restructuring Program will use education and outreach to help States, regional electric grid operators, and Federal agencies develop policies, market mechanisms, and programs that facilitate the effort to modernize and expand America's electric grid to ensure a more reliable and robust electric supply. Also to be undertaken is analysis and implementation of policy-related recommendations that would improve reliability and enhance the electric transmission system contained in the NTGS, identified in the August 2003 Blackout Investigation Final Report, or in pending energy legislation when enacted.

THE GRIDWISE AND GRIDWORKS INITIATIVES

OETD's FY 2005 budget request, reflecting the Administration's efforts to modernize and expand the electric grid, includes $10.5 million for the new GridWorks Initiative and the existing GridWise Initiative, which are aimed at reducing the likelihood and impact of reliability events, such as blackouts.

The GridWise and GridWorks Initiatives evolved from OETD's vision and roadmap process, documented in the *National Delivery Technologies Roadmap*. There was an identified need for a portfolio of technologies that crosscut the electric transmission and distribution system. Although continuing research in high temperature superconducting materials and electric storage devices was considered critical, there was also recognition that efforts to develop distributed intelligence, smart controls, advanced conductors, and power electronics needed to be accelerated and expanded.

GridWise denotes a modernized electric infrastructure framework where open, but secure, communication and information technologies, and associated standards, are used throughout the electric grid to enhance reliability and robustness, promote economic efficiencies, and provide value and choices to electricity consumers. The GridWise program activity (software-centric) comprises the intelligence – or brains – behind a modern electric grid that incorporates GridWorks (hardware-centric) technology.

GridWorks is focused on advanced equipment applications, taking an integrated approach to the entire electric system. It bridges the gap between the laboratory prototypes of the base programs and the application needs of the electric industry. GridWorks uses the facilities at DOE's national laboratories to accelerate the development and testing of advanced conductors, which can increase much needed transmission line capacity. It complements GridWise's architectural software development by developing and demonstrating associated hardware, such as sensors. GridWorks pursues advanced power electronic breakthroughs to provide faster means of limiting transmission problems before they propagate through the electric system.

HIGH TEMPERATURE SUPERCONDUCTIVITY

OETD's FY 2005 High Temperature Superconductivity budget request of $45 million reflects a $10.9 million increase to develop second generation wire usable in cables, generators, transformers, and motors – equipment that crosscuts the entire electric power value chain.

High temperature superconductors are a good example of advanced materials that have the potential to revolutionize electric power delivery in America. The prospect of transmitting large amounts of power through compact underground corridors, with minimal electrical losses over long distances, could significantly enhance the overall energy efficiency and reliability of the electric system, while reducing fuel use, air emissions, and any physical footprint. Also, breakthroughs in basic science are rapidly applied in the area of high temperature superconductivity. For instance, benefits from nanoscience research are accelerating progress in superconductivity wire development.

BUDGET AND PERFORMANCE INTEGRATION

The President's Management Agenda identified the need to tie R&D investment to performance and well-defined practical outcomes. Evaluation of the High Temperature Superconductivity (HTS) R&D Program through application of the FY 2005 Program

Assessment Rating Tool (PART), revealed that the program was well managed including use of near-term and long-term tracking systems to measure progress toward annual targets and long-term performance goals, use of independent peer reviews, spend plans, and site visit reviews. However, the HTS program has demonstrated only a "small extent" of results in achieving its long term performance goal. OETD is addressing this finding by devoting more of its resources to its long term performance goal: "by 2012, develop to the 100 percent operational capability level, wire and four types of HTS electric power prototypes with typically half the energy losses and half the size compared to conventional power equipment of the same rating."

The initiatives, GridWorks and GridWise, are aimed directly at improving reliability of the electricity delivery system by implementing advanced technologies and integrated-information management tools to overcome today's system limitations and to reduce the incidence of reliability events such as blackouts. As these initiatives move forward, DOE will ensure that the R&D investment is tied to performance and outcome. GridWorks and GridWise are essential elements in helping OETD to achieve its mission to lead the modernization effort of the Nation's electricity delivery system to ensure a more reliable and robust electricity supply, as well as economic and national security.

I thank you for the opportunity to testify today. I look forward to working together with you to make the reliable, efficient electricity system of the future a reality.